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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 108127 SGK:RWP:lj	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/AU2003/000280	International Filing Date (day/month/year) 10 March 2003	Priority Date (day/month/year) 8 March 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl.⁷ H01S 3/08, 5/10, H01L 21/02, G02B 26/00		
Applicant THE UNIVERSITY OF WESTERN AUSTRALIA et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 8 October 2003	Date of completion of the report 22 June 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer IRINA TALANINA Telephone No. (02) 6283 2203

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/AU2003/000280

I. Basis of the report**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims 1-25, 31, 33, 35-60	YES
	Claims 26-30, 32, 34	NO
Inventive step (IS)	Claims 36-60	YES
	Claims 1-35	NO
Industrial applicability (IA)	Claims 1-60	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)**NOVELTY (N) claims 26-30, 32 & 34****Claims 26-30, 32 & 34:**• **WO 2001/009995 (D1)**

This document discloses a VCSEL device with a tunable cavity resonator. The device includes a GaAs substrate 24, a moveable membrane 37 of SiN with a support structure 38, a pair of DBR's 10 & 12, a pair of electrodes 36 & 43, where the cavity resonator is tuned by electrostatically displacing the moveable membrane 37 [see Sec. "MEM Tunable VCSEL Fabrication Procedure" & figures 1-3 of D1]. The intrinsic stress in the membrane 37 is carefully controlled during the fabrication [see page 14 last para - page 16 first para of D1].

• **WO 1999/034484 (D4)**

This document discloses a tunable Fabry-Perot filter and a tunable VCSEL (see figures 1-3 of D4) and the corresponding fabrication techniques which are similar to those disclosed in D1.

Claims 26-29, 32 & 34:• **EP 1146377 (D2)**

This document discloses a Fabry-Perot filter device with a tunable optical cavity 100. The device includes a semiconductor substrate 103, a moveable membrane 102 with a support structure 119, a pair of mirrors 114 & 113, where the cavity is tuned by electrostatically displacing the membrane 102 (see figures 3, 4 & paragraphs [0011], [0017] in D2).

• **EP 1146378 (D3)**

This document discloses tunable Fabry-Perot filter devices (see figures 2, 3 of D3).

INVENTIVE STEP (IS) claims 1-35**Claims 26-30, 32 & 34: as above****Claims 1-25, 31, 33, 35:**

The claimed invention lacks an inventive step in light of any one of D1-D4 because the differences between each of these documents and the claimed invention, such as a particular choice of the materials for the sacrificial layer, the membrane, the substrate, etc, a design of the support structure, etc., represent routine workshop arrangements and/or variations which are well known in the art.

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VI. Certain documents cited**1. Certain published documents (Rule 70.10)**

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
P,X US 2002/0131458 A	19 September 2002	15 March 2001	15 March 2001

This document discloses a tunable Fabry-Perot vertical cavity photonic device and the corresponding method of fabrication. Claims 26-29, 32, 34 are not novel in light of this citation (see paragraphs [0011]-[0022] & figure 1 of the citation).

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
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VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

- (i) Claim 26 is not clear with regard to the features "relatively large distances" and "relatively low voltages" because the scope implied by "relatively large" and/or "relatively low" is uncertain.
- (ii) Claim 37 is not clear with regard to the phrase "in the region of 100 nm or 1,000,000 nm" because it appears to contain a typographical error (it appears that "or" should be replaced by "to").

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Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V:

The features of the remaining claims 36-60 are not found in any single document published before the earlier priority date of the claims. In particular, the prior art documents listed in the International Search Report do not disclose or suggest a method of fabricating a tunable cavity resonator for filtering incident radiation in the range from 1 micron to 20 microns by forming a membrane with low resultant stress and low pinhole density exhibiting a near-ideal Fabry Perot response.